

Developing APS Roadmap Scenarios

March 9, 2012

Introduction

The APS Roadmap is a long-term plan for the locations of current and potential future programs/beamlines at the APS. As such it must incorporate not only the activities included in the base and contingent scope of the APS Upgrade project, but also proposed activities outside of the Upgrade. In developing the Roadmap, a goal is to minimize disruption or relocation of the existing CAT or XSD beamlines. With the possible exception of the soft x-ray program on 2-ID, it is our plan to preserve all current programs. However, some beamlines may have to be relocated, for instance programs that occupy sectors that are potential sites for a long beamline (> 200m), namely sectors 18, 19, and/or 20. Because only three unoccupied insertion device ports remain (sectors 25, 27, and 28), much of the future expansion of insertion device beamlines will be through the addition of "cants" that allow two beamlines to occupy one sector, and many currently non-canted sectors are thus considered to be options for future expansion by canting. Also, we will consider the option of relocating or rebuilding the ASD diagnostic program currently located at sector 35.

We have focused on scenarios that reflect the rankings of the Upgrade proposals made by APS Scientific Advisory Committee in March 2011 (see Appendix I). We have developed several roadmap scenarios for discussion by the community, since each scenario has its advantages and disadvantages. The scenarios presented here consider only the insertion device ports and defer consideration of those beamlines that will be sited on bending magnet sources, since BM ports are much more readily available and siting is not as difficult a task.

Developing APS Roadmap Scenarios

There are several assumptions common to all of the scenarios put forward here. In particular, it is assumed that the SPX beamlines (CDR 4.2.2) will be located at sectors 6 and 7 because of the location of the support building 400A that is under construction inside the ring.

Sectors where we assume that the current program remains or is upgraded in place (potentially with a cant), and/or are not considered because they are already canted or will be the location of SPX components are sectors 1, 3, 5, 6, 7, 11, 12, 13, 14, 16, 21, 23, 24, 26, and 29. Sectors for potential future development as described below include 8, 10, 17, 22, 31, and 33. The remaining sectors 'in play' in the scenarios presented here are 2, 4, 9, 15, 18, 19, 20, 25, 27, 28, 30, 32, 34, and 35.

One of the most pressing decisions that has to be made is the location of the Dynamic Compression Sector (DCS) which, although not a part of the APS-U project, is on a faster

construction track, so that a decision needs to be made early in order not to delay its progress. To maintain the proposed schedule for this project, it is assumed that DCS will be located in a sector that currently is not occupied by a user program, i.e. sectors 25, 27, or 28, or in sector 35 which has been identified as a good location but is occupied by the APS diagnostics beamline.

At present 35-ID beamline has two independent components: photon beam diagnostics (labeled ASD-D in the scenarios) and a DC current transformer/stripline required for electron current measurements. The DC current transformer/stripline must be installed in a portion of a storage ring straight section and if relocated should go to a straight where the entire length is not needed for insertion devices. There are several short- and long-term possibilities that will not be discussed further here.

For each scenario, once DCS is assigned a sector location, choices were made for the locations of the insertion device beamline proposals ranked Very Strongly Recommended by the APS SAC and any displaced programs:

- Wide-Field Imaging Beamline (CDR 4.3.2) (must be in Sectors 18, 19 or 20)
- In-Situ Nanoprobe/Cryo-nanoprobe (CDR 4.3.7 & 4.3.8)
- Resonant Inelastic X-ray Scattering (CDR 4.4.4)
- Magnetic Spectroscopy (CDR 4.5.5)
- X-ray Interface Studies - Tunable ID Beamline (CDR 4.6.2)
- Micro & 3D Diffraction (CDR 4.6.4)
- Displaced programs currently at Sectors 6 and 7 and any others

For each scenario choices were then made regarding those new insertion device beamline proposals ranked Strongly Recommended and Recommended and any further displacements:

- Advanced Spectroscopy Beamline (CDR 4.4.2)
- LERIX-2 Beamline (CDR 4.4.3)
- High Magnetic Field Scattering (CDR 4.5.2)
- X-ray Interface Scattering - Fixed Angle ID Beamlines (CDR 4.6.2)
- High Speed Imaging (CDR 4.3.2)
- Coherent Diffraction Imaging (CDR 4.3.3)
- Liquid Surface Scattering (CDR 4.6.3)

Future Programs

The roadmap should also support potential locations for future programs that are not in-place upgrades of existing programs and/or not included in the APS-U. A list of some of the future new insertion device programs include:

- Enhanced SAXS/WAXS (proposal approved by SAC)
- Microfocus MX beamline (proposal approved by SAC)

- Extended wavelength range MX beamline (proposal approved by SAC)
- BioNanoprobe (proposal approved by SAC)
- Extreme Materials (XMAT) beamline (LOI approved by SAC)

Potential locations for these future programs include those sectors that are not already canted, are not included in the above scenarios, and are not the locations of SPX cavities (e.g. sector 5), dual undulators, superconducting undulators, or the current transformer/stripline. These may include sectors 8, 10, 17, 18 (if not WFI), 19 (if not WFI), 22, and 31.

Summary of Scenarios

Table 1 gives a summary of the currently proposed Roadmap Scenarios.

Table 1 Roadmap Scenarios Summary

	A	B	C	D	E	F	G	H	I	J
DCS	35-ID	35-ID	27-ID	28-ID	35-ID	35-ID	35-ID	35-ID	35-ID	35-ID
ISN	2-ID-2	2-ID-2	2-ID-2	2-ID-2	9-ID-2	9-ID-2	9-ID-2	25-ID-1	9-ID-2	9-ID-2
MS-S	4-ID	4-ID	4-ID	4-ID	4-ID	2-ID-2	25-ID-1	2-ID-2	2-ID-2	2-ID-2
RIXS	27-ID	27-ID	35-ID	27-ID	27-ID	27-ID	27-ID	27-ID	27-ID	27-ID
S3DD micro	34-ID-2	34-ID-2s	34-ID-2s	34-ID-2	34-ID-2	34-ID-2	34-ID-2	34-ID-2	34-ID-2	34-ID-2
S3DD nano	34-ID-1s	34-ID-2s	34-ID-2s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s
WFI	20-ID	20-ID	20-ID	19-ID	20-ID	20-ID	19-ID	19-ID	20-ID	20-ID
XIS	28-ID	28-ID	28-ID	25-ID	28-ID	28-ID	28-ID	28-ID	28-ID	28-ID
ASD-D	30-ID	30-ID	30-ID	35-ID	30-ID	30-ID	30-ID	30-ID	30-ID	30-ID
ASL	25-ID	25-ID	25-ID	20-ID	25-ID	25-ID	20-ID	20-ID	25-ID	25-ID
BCDI	32-ID-2	34-ID-1s	34-ID-1	32-ID-2	32-ID-2	32-ID-2	32-ID-2	32-ID-2	32-ID-2	32-ID-2
BIO	18-ID	18-ID	18-ID	9-ID-2	18-ID	18-ID	9-ID-1	9-ID	18-ID	18-ID
MD	9-ID-1	9-ID-1	9-ID-1	9-ID-1	2-ID	9-ID-1	25-ID-2	2-ID-1	2-ID-1	2-ID-1
SBC	19-ID	19-ID	19-ID	18-ID	19-ID	19-ID	18-ID	18-ID	19-ID	19-ID
XSD LSS	9-ID-2	9-ID-2	9-ID-2s	15-ID-2	15-ID-2	15-ID-2	15-ID-2	15-ID-2	15-ID-2	28-ID*
XSD mDiff	34-ID-1s	34-ID-1s	2-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s	34-ID-1s
XSD mFluor	2-ID-1	2-ID-1	2-ID-1s	2-ID-1	9-ID-1	2-ID-1	2-ID	25-ID-2	9-ID-1	9-ID-1

Orange denotes location unchanged

Yellow denotes a scope reduction

For notation n-ID-x, x denotes a cant. The use of "1" or "2" does not indicate which half of the straight section is assigned.

An "s" after the beamline designation indicates the beamline is shared with another program

* Denotes XSD-LSS as part of XIS

DCS—Dynamic Compression Sector
 ISN—In-Situ Nanoprobe
 MS—S-Magnetic Spectroscopy (Soft)
 RIXS—Resonant Inelastic X-ray Scattering
 S3DD—Sub-micron 3D Diffraction
 WFI—Wide Field Imaging
 XIS—X-ray Interface Science
 ASD-D—ASD Diagnostics

ASL—Advanced Spectroscopy/LERIX
 BCDI—Bragg Coherent Diffractive Imaging
 BIO—BIO-CAT
 MD—Magnetic Diffraction
 SBC—SBC-CAT
 XSD LSS—Liquid Surface Scattering (9-ID)
 XSD mDiff—micro-Diffraction (2-ID)
 XSD mFluor—micro-Fluorescence (2-ID-D/E)

Additional Information and Feedback

To obtain additional information and give feed back, please go to the website:

<http://aps.anl.gov/Upgrade/Forum/>

The scenarios and feedback received will be presented to the APS Scientific Advisory Committee on March 20, 2012.

Appendix I: APS Scientific Advisory Committee Upgrade Proposal Rankings**Very Strongly Recommended Proposals**

CDR Number	Proposal Title	Acronym
4.2.2	SPX Facility Hard X-ray Diffraction and Imaging	SPXIM
4.2.2	SPX Facility Hard X-ray Spectroscopy	SPXSS
4.3.2	Wide-Field Imaging Beamline	WFI
4.3.4	High-Energy Tomography – BM beamline	HEXT
4.3.7, 4.3.8	In-situ Nanoprobe/Cryonanoprobe (NGN)	ISN
4.4.4	Resonant Inelastic X-ray Scattering (MERIX)	RIXS
4.5.4	High-Energy Diffraction (in-place upgrade at 1-ID)	HEXD
4.5.5	Magnetic Spectroscopy	MS-S (soft) MS-H (hard)
4.6.2	X-ray Interface Science – Tunable ID Beamline	XIS-T
4.6.4	Micro and 3D Diffraction	S3DD
4.7.3	Cryo Sample Preparation Facility	
4.7.4	Enhanced SAXS/WAXS	ESW
4.7.5	Microfocus MX Beamline	MMX
4.7.6	Enhanced Pump/Probe for Physical Sciences (in place at 14-ID)	HFPP
4.7.6	Enhanced Time-Resolved MX Beamline (in place at 14-ID)	TRMX

Strongly Recommended Proposals

CDR Number	Proposal Title	Acronym
4.2.2	SPX Facility Soft X-ray Beamline – BM beamline	SPSXS
4.3.3, 4.3.7	TXM (in place at 32-ID)	TXM
4.3.5	XPCS and Coherent GIXS (in place at 8-ID)	XPCS-CGIXS
4.3.6	Fluid Dynamics Imaging Beamline - BM beamline	FSD
4.4.2	Advanced Spectroscopy Beamline	ASL
4.4.3	LERIX-2 Beamline	ASL
4.5.2	High Magnetic Field Scattering	MD
4.5.3	High Pressure Studies Using Sub-micron Beams (in place at 16-ID)	HP
4.6.2	X-ray Interface Science – Fixed Angle ID Beamlines	XIS-FA
4.6.5	Resonant Interface Scattering (in place at 33-ID)	RIS
4.7.2	BioNanoprobe	BNP
4.x.x	Extended Wavelength Range MX Beamline	EWMX

Recommended Proposals

CDR Number	Proposal Title	Acronym
4.2.3	Laser Initiated Time Resolved XAFS/WAXS (in place at 11-ID)	TR-XAFS
4.3.2, 4.3.3	High Speed Imaging (in place at 32-ID)	HSI
4.3.3	Coherent Diffraction Imaging	BCDI
4.4.5	HERIX (in place at 30-ID)	HERIX
4.4.6	Nuclear Resonant Scattering (in place at 3-ID)	NRS
4.4.7	Catalyst Center - BM Beamline	CC
4.6.2	X-ray Interface Science – BM Beamline	XIS-BM
4.6.3	Liquid Surface Scattering	XSD LSS